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Table 1. Evaluation of Agglomerated Superabsorbent Polymer-Based Solid Lubricant Compositions: Short, Intermittent, and Extended-Term Stress Tests

Composition formulation	Composition type; size (diameter x thickness); weight (g)	Maximum torque (ft-lbs) applied to composition at 3450 RPM	Stopped motor (Yes, No)	Compositional appearance; structural integrity satis- factory (+)/unsatisfactory (-)
Short-Term Tests				
WaterLock® A-140 (65% w/w) + Citr flex A-4 (10% w/w) + R yc® 481 Oil (25% w/w)	Disquet; 35 x 10 mm; 9.04	271	No	Matrix Flat; +
WaterLock® A-140 (65% w/w) + Ar surf® 66-E2 (10% w/w) + Royco 481 Oil (25% w/w)	Disquet; 35 x 9 mm; 9.04	271	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Graphite (25% w/w) + R yc® 481 Oil (25% w/w)	Disquet; 34 x 10 mm; 8.91	271	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Graphite (5% w/w) + Aro- surf® 66-E2 (40% w/w) + R yc® 481 Oil (5% w/w)	Disquet; 34 x 9 mm; 9.12	271	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Arosurf® 66-E2 (40% w/w) + R yc® 481 Oil (10% w/w)	Disquet; 35 x 9 mm; 8.97	271	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Ar surf® 66-E2 (40% w/w) + Graphite (10% w/w)	Disquet; 35 x 9 mm 9.04	271	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Graphite (20% w/w) + Aro- surf® 66-E2 (10% w/w) + R yc® 481 Oil (20% w/w)	Disquet; 35 x 9 mm; 9.15	271	No	Matrix Flat; +

Table 1. (Cont.) Evaluation of Agglomerated Superabsorbent Polymer-Based Solid Lubricant Compositions: Short, Intermittent, and Extended-Term Stress Tests

Composition/ formulation	Composition type; size (diameter x thickness); weight (g)	Maximum torque (ft-lbs) applied to composition at 1450 RPM	Stopped motor (Yes, No)	Compositi n appearance; structural integrity satis- factory (+)/unsatisfactory (-)
Short-Term Tests				
WaterLock® A-140 (50t w/w) + Citr flex® A-4 (10t w/w) + Graphite (20t w/w) + Royco® 481 Oil (20t w/w)	Disquet; 35 x 10 mm; 9.12	271	No	Matrix Flat; +
WaterLock® A-100 (50t w/w) + Arosurf® 66-E2 (50t w/w)	Disquet; 32 x 8 mm; 5.89	271	No	Matrix Flat; +
WaterLock® A-120 (50t w/w) + Arosurf® 66-E2 (50t w/w)	Disquet; 32 x 8 mm; 5.88	271	No	Matrix Flat; +
WaterLock® A-140 (75t w/w) + Royco® 481 Oil (25t w/w)	Granules; 6.6 x 6.9 mm; 9.13	271	No	Matrices Flat; +
WaterLock® A-140 (50t w/w) + Marvel® Mystery Oil (50t w/w)	Granules; 2.5 x 2.8 mm; 9.06	271	No	Matrices Flat; +
Intermittent-Term Tests				
WaterLock® A-140 (50t w/w) + Arosurf® 66-E2 (40t w/w) + Graphite (50t w/w) + Royco® 481 Oil (5t w/w)	Disquet; 33 x 8 mm; 9.12	271	No	Matrix Flat; +
WaterLock® A-140 (50t w/w) + Arosurf® 66-E2 (10t w/w) + Royco® 481 Oil (25t w/w)	Disquet; 35 x 10 mm; 9.12	271	No	Matrix Flat; +
WaterLock® A-140 (65t w/w) + Arosurf® 66-E2 (10t w/w) + RYC® 481 Oil (25t w/w)	Disquet; 35 x 10 mm; 9.04	271	No	Matrix Flat; +

Table 1. (Cont.) Evaluation of Agglomerated Superabsorbent Polymer-Based Solid Lubricant Compositions: Short, Intermittent, and Extended-Term Stress Tests

Composition \ formulation	Composition type, size (diameter x thickness), weight (g)	Maximum torque (ft-lbs) applied to composition at 3450 RPM	Stopped motor (Yes, No)	Composition appearance; structural integrity satis- factory (+)/unsatisfactory (-)•
Intermittent-Term Tests (cont.)				
WaterLock® A-140 (50% w/w) + Graphite (25% w/w) + Arosurf® 66-E2 (25% w/w)	Disquet; 35 x 9 mm; 8.91	271	No	Matrix Flat; +
WaterLock® A-140 (65% w/w) + Citroflex® A-4 (10% w/w) + Royco® 481 Oil (25% w/w)	Disquet; 35 x 9 mm; 9.08	271	No	Matrix Flat;
WaterLock® A-140 (50% w/w) + Graphite (25% w/w) + Royco® 481 Oil (25% w/w)	Disquet; 35 x 10 mm; 8.94	271	No	Matrix Flat; +
WaterLock® A-100 (50% w/w) + Arosurf® 66-E2 (50% w/w)	Disquet; 32 x 8 mm; 5.89	271	No	Matrix Flat; +
WaterLock® A-120 (50% w/w) + Ar Surf® 66-E2 (50% w/w)	Disquet; 32 x 8 mm; 5.88	271	No	Matrix Flat; +
Extended-Term Tests				
WaterLock® A-140 (65% w/w) + Citroflex® A-4 (10% w/w) + Royco® 481 Oil (25% w/w)	Disquet; 35 x 8 mm; 9.07	136	No	Matrix Flat; +
WaterLock® A-140 (65% w/w) + Arosurf® 66-E2 (10% w/w) + Royco® 481 Oil (25% w/w)	Disquet; 35 x 8 mm; 9.18	136	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Graphite (25% w/w) + Royco® 481 Oil (25% w/w)	Disquet; 35 x 10 mm; 8.99	136	No	Matrix Flat;

Table 1. (Cont.) Evaluation of Agglomerated Superabsorbent Polymer-Based 8 lid Lubricant Compositions: Short, Intermittent, and Extended-Term Stress Tests

Composition formulation	Composition type; size (diameter x thickness); weight (g)	Maximum torque (ft-lbs) applied to composition at 3450 RPM	Stopped motor (Yes, No)	Composition appearance; structural integrity satisfactory (+)/unsatisfactory (-)
Extended-Term Tests (cont.)				
WaterLock® A-140 (50% w/w) + Ar surf® 66-E2 (10% w/w) + Graphite (20% w/w) + Royco® 481 Oil (20% w/w)	Disquet; 35 x 10 mm; 8.82	136	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Citr flex® A-4 (10% w/w) + Graphite A-4 (20% w/w) + Ryc® 481 Oil (20% w/w)	Disquet; 34 x 10 mm; 9.01	136	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Graphite (25% w/w) + Arosurf® 66-E2 (25% w/w)	Disquet; 35 x 9 mm; 9.16	136	No	Matrix Flat; +
WaterLock® A-120 (50% w/w) + Ar surf® 66-E2 (50% w/w)	Disquet; 33 x 8 mm; 5.99	136	No	Matrix Flat; +
WaterLock® A-100 (50% w/w) + Ar surf® 66-E2 (50% w/w)	Disquet; 32 x 8 mm; 5.89	136	No	Matrix Flat; +
WaterLock® A-140 (50% w/w) + Arosurf® 66-E2 (50% w/w)	Disquet; 35 x 8 mm; 6.03	271	No	Matrix Flat; +

* Replications within a test series indicated that the agglomerated superabsorbent polymer-base lubricant compositions would prematurely stop the motor and/or show excessive uneven wear, scorching, cracking, shredding, and the like from the high levels of friction that are generated at high torque when the surface characteristics of the matrices in contact with the spinning sample-holding cup and tension plate are not smooth and even. Tests with several nonsuperabsorbent polymer-base lubricant compositions or standards (e.g., 10% w/w Royco® 481 Oil, 10% w/w Ar surf® 66-E2 + 10% w/w Graphite applied at 4.5 g) showed only short-term efficacy that is comparable to the superabsorbent polymer-base lubricant compositions. However, no effectiveness is observed with any nonsuperabsorbent polymer composition in intermittent or extended-term tests (i.e., the motor is rapidly stopped). A no sample metal to metal control is observed to stop the motor at 27 ft-lbs of torque.

Table 2. Evaluation of Variable-Viscosity Water-Based Superabsorbent Polymer-Based 8 lid Lubricant Compositions: Short-Term Tests

Composition formulation	Viscosity characteristics; weight (g)	Maximum torque (ft-lbs) applied to composition at 3450 RPM	Stopped motor (Yes, No)
Water (89.7% w/w) + Carbon (5% w/w) + Graphite (5% w/w) + ALC 8 rbe AB3P (0.3% w/w)	Viscous; 0.15	271	No
Water (89.8% w/w) + Carbon (5% w/w) + Graphite (5% w/w) + Favor® CA 100 (0.2% w/w)	Viscous; 0.15	271	No
Water (89.8% w/w) + Carbon (5% w/w) + Graphite (5% w/w) + Sanwet® IN-1500P (0.2% w/w)	Viscous; 0.15	271	No
Water (89.7% w/w) + Carbon (10% w/w) + Aridall® 1125F (0.3% w/w)	Semiviscous; 0.15	271	No
Water (89.7% w/w) + Carbon (10% w/w) + Aquasorb®/ AquaSt re®P (0.3% w/w)	Viscous; 0.15	271	No
Water (89.7% w/w) + Carbon (10% w/w) + Sanwet® IM- 1500P (0.3% w/w)	Viscous; 0.15	271	No
Water (89.7% w/w) + Carbon (10% w/w) + SuperSorb™ (0.3%)	Semiviscous; 0.15	271	No

Table 2. (Cont.) Evaluation of Variable-Viscosity Water-Based Superabsorbent Polymer-Based S L10 Lubricant Compositions: Short-Term Tests

Composition Formulation	Viscosity characteristics; weight (g)	Maximum torque (ft-lbs) applied to composition at 3450 RPM	Stopped motor (Yes, No)
Water (89.7% w/w) + Graphite (10% w/w) + DOW XU 40346-00 (0.3% w/w)	Semiviscous; 0.15	271	No
Water (89.7% w/w) + Graphite (10% w/w) + Stockosorb® 400P (0.3% w/w)	Semiviscous; 0.15	271	No
Water (89.7% w/w) + Graphite (10% w/w) + Alcosorb® AB3P (0.3% w/w)	Highly Viscous; 0.15	271	No
Water (89.7% w/w) + Graphite (10% w/w) + Favor® CA 100 (0.3% w/w)	Highly Viscous; 0.15	271	No
Water (89.7% w/w) + Graphite (10% w/w) + WaterLock® A-180 (0.3% w/w)	Semiviscous; 0.15	271	No

* Standards and control are observed to stop the motor before reaching the effective maximum torque of 271 ft-lbs.